

ASSOCIATED PCN COMPANY
Reply Comments on 2 GHz Unlicensed PCS

Interest: Experimental PCS licensee.

Band plan:

- WINForum's proposal for the expansion of the unlicensed band to as much as 65 MHz is detrimental to the establishment of licensed PCS. (p. 18).

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ASSOCIATION OF AMERICAN RAILROADS
Reply Comments on 2 GHz Unlicensed PCS

Interest: Railroads (relying on fixed microwave systems)

Plan for relocation of existing users:

- Supports industry efforts to establish mechanism, such as nonprofit entity or consortium, to fund and facilitate relocation of incumbent microwave licensees from 1910-1930 MHz band; however, urges Commission to not make any spectrum available for unlicensed operations until it is certain that mechanism is in place to accommodate all microwave licensees displaced from targeted band. (pp. 7-8).
- Emphasizes that burden to find equally reliable spectrum and pay relocation costs falls squarely on PCS industry; also urges Commission to encourage and monitor these activities and expedite its own efforts to gain access to federal government spectrum for displaced microwave licensees. (p. 8).
- Commission should fully investigate effect of U-PCS operations on bands adjacent to 1910-1930 MHz bands; should require that U-PCS guard bands be within the 1910-1930 MHz band and that U-PCS operators design their systems so as to not cause interference outside that band. (p. 9).

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AT&T**Reply Comments on 2 GHz Unlicensed PCS**

Interest: Common carrier long distance telephone company;
possible provider of PCS services.

Band plan:

- The overwhelming majority of commenters supports the FCC's proposal to allocate spectrum for unlicensed devices between 1910 and 1930 MHz. Most commenters also agree with AT&T that additional spectrum is necessary. The spectrum between 1895 and 1910 MHz is ideal because it is adjacent to 1910 to 1930 MHz. (pp. 19-22).

Plan for relocation of existing users:

- The majority of commenters concurs with AT&T's recommendation that an independent private industry advisory council be established to coordinate relocation of incumbent users. (pp. 22-24).
- Suggests raising capital for such an entity through voluntary loans or the posting of bonds. (p. 24).

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ERICSSON CORPORATION
Reply Comments on 2 GHz Unlicensed PCS

Interest: Equipment manufacturer

Band plan:

- For high speed data services, the Commission should look to higher bands (e.g., 5-6 GHz) where an allocation of 100 MHz can be made to accommodate higher data rates (4).

Channelization:

- The unlicensed device bands should not be subchannelized into separate allocations for voice and data, given the small amount of spectrum available (3).

Technical standards:

- Policies, rules and etiquettes adopted for the unlicensed device band should not preclude implementation of CDMA technology; i.e., should allow bandwidths up to 2.5-5 MHz and should not require fixed time slot lengths (3).
- The FCC must provide for implementation of instant dynamic selection of the least interfered channel (listen-before-talk). This concept is explained in detail in an attached Appendix A (3).
- Periodic (isochronous) speech/ISDN services should be prioritized, since these services will also support packetized wireless LAN data (explained in Appendix A) (3-4).

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GTE CORPORATION

Reply Comments on 2 GHz Unlicensed PCS Devices

Interest: Provider of local exchange and mobile service

Technical standards:

- Expresses concern that proposed power limits for unlicensed devices may be too high to ensure non-interfering operation; lower power limits may be more appropriate. (pp. 44-45).

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HEWLETT-PACKARD COMPANY
Reply Comments on 2 GHz Unlicensed PCS

Interest: Equipment manufacturer

Band plan:

- The proposed 20 MHz allocation is insufficient, and a minimum of 40-65 MHz should be allocated (2).
- Unlicensed devices cannot share with fixed microwave users (1-2).

Plan for relocation of existing users:

- WINForum should be constituted as a formal industry advisory committee by the Commission, and WINForum should be used to manage and fund the relocation of incumbent 2 GHz users (3).

Technical standards:

- WINForum should be constituted as a formal industry advisory committee by the Commission, and WINForum's spectral etiquette should be incorporated into the Commission's rules (3).

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LOWER COLORADO RIVER AUTHORITY
Reply Comments on 2 GHz Unlicensed PCS

Interest: Public power company that provides electric service to municipalities and cooperative in central Texas

Plan for relocation of existing users:

- Supports industry efforts to establish mechanism, such as nonprofit entity or consortium, to fund and facilitate relocation of incumbent microwave licensees from 1910-1930 MHz band, but urges Commission not to make any spectrum available for unlicensed operations until such a mechanism is in place to accommodate all microwave licensees displaced from band. (pp. 8-10).
- Reiterates that burden is on PCS industry to find all displaced microwave licensees equally reliable spectrum and pay relocation costs; urges Commission to encourage and monitor industry activities, and expedite its own efforts to gain access to federal government spectrum for displaced microwave licensees. (p. 9).
- States that Commission should investigate effect of U-PCS operations on bands adjacent to 1910-1930 MHz frequencies; require that U-PCS guard bands be within 1910-1930 MHz band; and require that U-PCS operators design systems so as to avoid causing interference outside band. (p. 10).

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MOTOROLA INC.**Reply Comments on 2 GHz Unlicensed PCS****Interest:** Equipment manufacturer**Band plan:** (p. 6)

<u>Block</u>	<u>Spectrum Segment</u>
A	1850-1870/1930-1950
B	1870-1890/1950-1970
C	1890-1900
D	1900-1910
E	1910-1930

- Blocks A and B provide 40 MHz per operator for wide area PCS services.
- Block C is unpaired 10 MHz shared by two licensees for local area services.
- Block D can either be used in the same manner as Block C or to increase the nonlicensed PCS allocation.
- Block E is unpaired 20 MHz for nonlicensed PCS.
- While additional allocations for unlicensed devices should be carefully considered, the Commission should not delay the immediate allocation of the 1910-1930 MHz band for unlicensed PCS devices. (p. 14)

Plan for relocation of existing users:

- An unlicensed devices consortium is the best possible method to coordinate the relocation and compensation of 1910-1930 MHz licensees. (p. 27, 28)
- Assuming a per-link relocation cost of \$135,455, the total cost of relocating 357 non-local government links is approximately \$48.4 million. Relocating all 452 links in the 1910-1930 MHz band would be approximately \$61.3 million. These estimates are likely low because they assume that the links are one-way. (p. 33)
- A not-for-profit entity should be established to assume responsibility for negotiating with incumbent users and to raise and disburse the money to pay for the relocation. (p. 38)
- Companies planning to manufacture unlicensed PCS devices in the 1910-1930 Mhz band would provide the initial capital, either in the form of cash or cash equivalents, to finance the single entity. (p. 40)

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- There are several options for the entity to recover reimbursement of the initial capital contributions. A surcharge on equipment sold appears to provide an equitable means of apportioning the costs of the relocation. (p. 41)
- FCC could authorize the establishment of such an entity as a frequency coordinator under Section 332 of the Communications Act. (p. 43) Alternatively, the FCC could condition grants of type acceptance on participation in the entity. (p. 44) Finally, the FCC could issue a license to the entity. Manufacturers would be required to become members of the licensee entity before selling equipment in the band. (p. 45, 46)

Technical Standards:

- One or more spectral etiquettes can be developed to control interference between and among non-licensed devices. The FCC should rely on industry standards bodies to promulgate technical standards. (p. 50)
- The type acceptance rules must contain an enforcement mechanism to ensure that new equipment meets industry formulated etiquettes. (p. 51)

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NORTH AMERICAN TELECOMMUNICATIONS ASSOCIATION
Reply Comments on 2 GHz Unlicensed Devices

Interest: A trade association of more than 600 manufacturers, suppliers, distributors, and users of business telecommunications equipment.

Band plan:

- Almost all parties commenting on the issue support the FCC's proposal to allocate spectrum for unlicensed PCS devices as there is a vast, unserved need for wireless voice and data communications within the office environment and the office market provides a natural "laboratory" for the development of such technology. (pp. 1-2)
- Many parties agree that the proposed allocation of 20 MHz is insufficient even as an initial allocation. (pp. 2-4)
 - Comments range in their estimates of the amount of spectrum immediately needed from 35 to 70 MHz. (pp. 2-3)
 - These estimates generally assume relatively clear spectrum and the development of a spectrum "etiquette". As these favorable conditions are not assured, the FCC must expand its proposed allocation for unlicensed PCS. (pp. 3-4)

Plan for relocation of existing users:

- There is a consensus that the FCC should authorize the formation of a collective entity to fund and administer the clearing of unlicensed PCS spectrum even if partial, rather than complete, clearing will suffice. (pp. 4-5)
- NATA is exploring the feasibility of establishing such an entity and expects to provide additional information to the FCC as concrete proposals emerge. (p. 5)

Technical standards:

- Commenters agree with NATA that the FCC's technical rules must allow for a wide range of technological diversity and experimentation. (p. 4)
- The FCC should carefully consider the WINForum's efforts to develop a spectrum etiquette. (p. 4)

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NORTHERN TELECOM
Reply Comments on 2 GHz Unlicensed PCS

Interest: Equipment manufacturer

Band plan:

- Supports 3 providers with 30 MHz each and 20 MHz for unlicensed devices (1-2).
- Co-existence with OFS users is unworkable in light of the mobility of equipment and the degree of sophistication of the prospective users (5-6).

Plan for relocation of existing users:

- The FCC's proposal for clearing licensed bands cannot be applied to the unlicensed band and NT supports ongoing industry efforts to manage relocation (7).
- A coordinator could be authorized by the FCC under Section 332(b) of the Communications Act; NT endorses the suggestion that WINForum could be a suitable candidate (7-8).
- Participation in the coordination efforts must be mandatory, but does not believe it legally could be "enforced" through the equipment authorization process; NT suggests instead reviewing Apple's proposal for a transmitter identification (8-9).

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NORTHWEST IOWA POWER COOPERATIVE
Reply Comments on 2 GHz Unlicensed PCS

Interest: Rural electric utility

Plan for relocating existing users:

- Cautions Commission against allocating spectrum for unlicensed PCS. If interference should develop, existing 2 GHz users would have little chance of locating its source. Even if the source of the interference is found, the 2 GHz user has no recourse to resolve the problem (3).

Other:

- These comments primarily address issues raised in ET Docket 92-9 and are designed as joint comments for the two proceedings.

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NYNEX CORPORATION
Reply Comments on 2 GHz Unlicensed PCS

Interest: Local exchange and cellular provider.

Other:

- Allocating spectrum for unlicensed devices will help seped the delivery of mass market PCS services. (pp. 14-15).

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OMNIPPOINT CORPORATION
Reply Comments on 2 GHz Unlicensed PCS

Interest: Pioneer's preference tentative selectee, equipment manufacturer, and prospective new service provider

Band plan:

- It is unanimously agreed that unlicensed devices will require clear spectrum (8).
- In exchange for licensed carriers being granted 40 MHz each with the right to "hunt" in 60 MHz, licensed carriers will undertake to relocate all users in the unlicensed band (9).

Plan for relocation of existing users:

- A consortium to buy out existing users appears to be a good idea, but in industry fora, not even the largest telecommunications equipment vendors would agree to contribute money in advance (8).
- A consortium brings up many other practical questions as well regarding compliance and pro rata collection of funds (8).

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PACIFIC TELESIS GROUP
Reply Comments on 2 GHz Unlicensed PCS

Interest: Regional Bell Operating Company

Band plan:

- Supports 3 licenses of 25 MHz each, with 65 MHz for unlicensed devices (20, 43-45).

Technical standards:

- Bellcore research shows that prospective PCS users want coverage while in clients' offices; therefore (1) CAI standards should also apply to a portion of the unlicensed device spectrum to promote interoperability (i.e., a portion of the spectrum should be dedicated to the licensed PCS CAI) (48); and (2) all unlicensed voice systems should offer wireless access to the PSTN for visitors via CAI (49).

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PULSE ENGINEERING INC.

Late-filed Comments on 2 GHz Unlicensed Devices

Interest: U.S.-based international electronics company

Band plan:

- The Commission has underestimated the spectrum requirements for unlicensed PCS -- an additional 70 MHz should be allocated for this purpose (3).

Technical standards:

- Recommends that standards be adopted and certification required for transceiver subsystem circuitry in order to facilitate speedy implementation. Without a set standard, vendors would wait until orders are placed prior to investing in new designs (2-3).
- The transmitter frequency stability proposed in Section 99.419 is unnecessarily restrictive -- a frequency stability of 50-100 ppm should be sufficient (3-4).

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ROLM
Reply Comments on 2 GHz Unlicensed PCS

Interest: Equipment manufacturer

Band plan:

- Agrees with leaders in data communications, major PBX manufacturers, and WINForum that more than 20 MHz is needed for unlicensed PCS devices (3-4).
- ROLM agrees as a general matter that clear spectrum will be needed for unlicensed devices; however, some unlicensed devices may be able to co-exist under certain circumstances and the FCC should allow those devices to be implemented prior to full band clearing (4-5).

Plan for relocation of existing users:

- Supports Apple's plan to "repack" 1910-1930 MHz users in other parts of the 1850-1990 MHz band (5-6).
- The feasibility of repacking could be enhanced by relocating some users into the 1710-1850 MHz federal government bands. Allowing use of government spectrum would benefit new technology deployment by not requiring completely vacating the 2 GHz band; lowering costs of transitioning existing users; reducing relocation timeframes; allowing some services to be deployed prior to full relocation; and creating less potential for emerging service providers to feel pressured into paying exorbitant relocation costs (6).

Technical standards:

- ROLM suggests that digital modulation be required; that power be limited to 250 mW; that any channelization should be flexible and accommodate all viable access technologies; and that any spectrum etiquette be technology-neutral (7).

Other issues:

- The FCC should uncouple the unlicensed device proceeding from the licensed proceeding to speed resolution of unlicensed device issues (7-8).

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ROSE COMMUNICATIONS, INC.
Reply Comments on 2 GHz Unlicensed PCS

Interest: Equipment manufacturer

Band plan:

- Agrees with Hatfield and Associates, WINForum and Interdigital that the unlicensed device allocation should be increased beyond the original 20 MHz to at least 40 MHz (2-5).
- Failing to allocate sufficient spectrum will drive providers to high cost solutions to sharing, and thus adversely affect the price of unlicensed devices (5).

Channelization:

- Agrees with Apple that, given the vastly different technical requirements for voice and data systems, the Commission should channelize the unlicensed device band into two separate suballocations (5-6).

Other issues:

- The Commission should unbundle consideration of unlicensed devices from the licensed 2 GHz proceeding, since the economic cost of delay is high and there are numerous complex issues in the licensed proceeding that do not bear on unlicensed devices (6-7).

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SOUTHWESTERN BELL CORPORATION
Reply Comments on 2 GHz Unlicensed PCS

Interest: Regional Bell Operating Company

Band plan:

- Unlicensed devices will require clear spectrum (24).
- Guard bands and guard zones should be established to protect incumbent users (23).
- The FCC should recognize that operations in the 1900-1910 MHz and 1930-1940 MHz band will be affected by unlicensed devices in the 1910-1930 MHz band (24).

Technical standards:

- Agrees with UTC that proposed peak power levels will not provide protection to existing users; FCC authorized PCS transmitting equipment should be required to avoid causing harmful interference, and should not be capable of transmitting, without prior authority and assurances of non-interference, from an associated base station (23).

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SPECTRALINK CORPORATION
 Reply Comments on 2 GHz Unlicensed PCS

Interest: Unlicensed device manufacturer

Band plan:

- At least 20 MHz should be allocated for unlicensed devices; voice systems alone will require 30 MHz (3).

Channelization:

- Voice and data should be segregated due to fundamental differences (access and hold times) between these systems; voice users cannot be delayed or interrupted and a technology-neutral channelization is needed (5).
- The voice band should be channelized into 1.25 MHz blocks to accommodate a variety of technologies; smaller channel systems can "clump" usage to minimize interference (5).

Plan for relocation of existing users:

- Agrees with commenters that clear spectrum is needed for unlicensed devices and that all existing users should be relocated prior to any unlicensed device use of the band (2).

Technical standards:

- Listen-before-talk should not be used for voice systems, since LBT systems do not accommodate differing bandwidths; fading may give rise to "false" free indications, thus interrupting ongoing calls; and LBT is incompatible with "beacon" channels used for cellular deployments (3-4).
- Spectralink suggests use of a "least interfered channel" etiquette as being more suitable, and that basic etiquette requirements be limited to peak power, power density, and bandwidth occupancy (4).
- Agrees with WINForum that power density (p) should be limited to $p = (1 \times E^{-4}) \times \sqrt{Hz}$ (6).
- Frequency stability of 1 ppm is unnecessary; Spectralink concurs with Motorola that filtering and a reference oscillator of ± 50 ppm is sufficient (6).
- Adaptive power control should not be required for unlicensed voice systems since it does not appreciably reduce inter-system interference (it attempts to compensate for indoor multipath interference and dispersive fading, resulting in high transmit power in any event) and adds cost and complexity to user devices (7).

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TANDY CORPORATION**Reply Comments on 2 GHz Unlicensed PCS Devices**

Interest: Equipment manufacturer and retail distributor of consumer electronic products.

Plan for relocation of existing users:

- Agrees in principle with Telocator proposal that a non-profit consortium (of manufacturers of unlicensed PCS devices) assume financial responsibility for relocating existing microwave licensees. However, since some devices will be manufactured overseas, a more equitable arrangement would require the consortium also to include entities that import unlicensed PCS devices (3-4).

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TELEPHONE & DATA SYSTEMS, INC.
Reply Comments on 2 GHz Unlicensed PCS

Interest: Provider of telephone, cellular and paging services.

Band plan:

- Contrary to the assertion of Pacific Telesis, it is neither necessary nor justifiable to allocate 65 MHz of spectrum for unlicensed devices if the effect is to diminish the amount of spectrum for licensed PCS. (pp. 13-14).

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TELOCATOR**Reply Comments on 2 GHz Unlicensed PCS**

Interest: Personal communications industry association.

Channelization:

- Many commenters stated that channelization of 1910-1930 MHz should be left flexible so industry can develop technologies and standards. (pp. 21-22).

Plan for relocation of existing users:

- The comments support FCC use of the spectrum authorization or equipment approval processes to ensure the participation of unlicensed PCS providers in an entity that can assume the relocation costs of 2 GHz microwave licensees. (p. 23).

Technical standards:

- Technical regulations should be left to industry standards groups. (pp. 21-22).

Other:

- Appendix A: PCS Standards Requirements Document: Service Description Standards.
- Appendix B: Report of the Joint Experts' Meeting on PCS Air Interface Standards.

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U S WEST, INC.
Reply Comments on 2 GHz Unlicensed PCS

Interest: Regional Bell Operating Company

Band plan:

- Supports four licensees with 25 MHz each and 40 MHz for unlicensed devices (30-31).

Channelization:

- Half of the 40 MHz should be configured as FDD duplex channels (32-33).

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UTILITIES TELECOMMUNICATIONS COUNCIL
Reply Comments on 2 GHz Unlicensed PCS

Interest: National representative on communications matters for the nation's electric, gas, water and steam utilities

Band plan:

- Accepts 20 MHz allocation for unlicensed PCS use. (p. 32).

Plan for relocation of existing users:

- Supports FCC-mandated consortium of PCS manufacturers/vendors to pay relocation costs (pp. 19-23).
- States that relatively light use of 1910-1930 MHz band should allow consortium to determine the total cost of clearing entire band (using FCC low-end estimate of \$125,000 per station, total cost to clear band would be about \$63 million); costs could be substantially reduced if FCC allowed existing microwave users in this band to relocate on co-primary basis to another portion of 2 GHz band. (pp. 19-20).
- States that API proposal giving existing microwave users in 1910-1930 MHz band a one-year transition period in which to relicense affected paths in other frequency bands might be workable if deployment of unlicensed PCS were limited to urban areas; however, consensus of commenters is that unlicensed PCS will not be confined to specified or predictable locations, but will instead be a nationwide phenomena; plan fails to take into account need for band clearing on nationwide basis, and time necessary for relicensing, siting, engineering, and building replacement facilities. (pp. 20-21).
- Asserts that, until issue of who will pay costs of microwave relocation is resolved, it is premature to discuss any mandatory date by which microwave licensees should vacate 1910-1930 MHz band; in addition, API's suggestion that existing microwave users choosing not to relicense within a one-year period revert to secondary status is inconsistent with "transition framework" adopted in ET Docket No. 92-9. (pp. 21-22).
- Asserts that, in relocating existing microwave systems, FCC must adopt rules ensuring operational

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